

Fall 2002
Vol. 16, No. 1

OUTLOOK

**On Geology, Land Survey, Water Resources,
Dam Safety and the State Water Plan**

INSIDE:

- * JAMES DAVID
VAUGHN RETIRES
- * GEOLOGICAL
SURVEY ACCEPTS
ARROWHEAD
COLLECTION
- * NEW 2002
MISSOURI DROUGHT
PLAN RELEASED
- * ARDEL RUEFF
RETIRES
- * DEPARTMENT
PUBLISHES
CENTRAL MISSOURI
WATER PLAN
REPORT
- * UPCOMING
MEETINGS

MYSTERY SANDSTONES OF THE LAKE OF THE OZARKS

Geologists with the Geological Survey and Resource Assessment Division of the Department of Natural Resources are currently working in the Lake of the Ozarks area collecting data to create detailed geologic maps that can be used to support resource management decisions in this rapidly growing part of Missouri. The bedrock throughout almost all of the Ozarks is classified as sedimentary. That is, rock originally made up of sediments deposited by water, wind, or the weathering of parent material in some very ancient landscape. In Missouri, most sedimentary rocks were originally formed in large shallow seas. The sediments were deposited in layers with younger layers, of course,

deposited on top of older layers. Though this is an over-simplification of the process, the geology in this part of the world is sometimes referred to as "layer-cake." The natural world is full of surprises, however, and has left behind some mysterious sandstones that don't seem to fit the pattern.

These isolated masses of sandstone are made up almost entirely of very fine sand, and in most cases, appear to be a bedrock layer that has been turned on edge. Similar sand bodies are scattered throughout the Ozarks and often form prominences that are called "blossom rocks" or "standing rocks," however, there are an unusually high number of occurrences of these sandstones in Camden County.

Several of these mysterious sandstone masses form ridges up to 200 feet long and 15 to 25 feet high, creating very spectacular exposures. The sandstones usually have several vertical cracks, or "joints," that enhance the impression that this is a bedrock layer that is standing on end. Bedrock layers standing on end are always exciting to a geologist, but closer inspection revealed that that is usually not at all the case with these sandstones. The sandstone is made up almost entirely of very, very fine sand, but here and there, within the sand are layers of gravel that are horizontal, or at least nearly so. The mystery grows!

Another mysterious aspect of these sandstones is their relationship to surrounding bedrock layers. Throughout the lake area, bedrock is made up of the rather layer-cake sequence of Eminence Dolomite, Gasconade Dolomite, Roubidoux Formation and Jefferson City Dolomite, listed in order from oldest to



Mystery sandstones. Photo by Edith Starbuck.

continued next page...

youngest. The mystery sandstones appear to occur within, or on top of rocks of varying ages from the Gasconade Dolomite to the Jefferson City Dolomite. The most revealing exposure of these sandstones is found in Carrot Bluff along the Lake of the Ozarks between mile markers 22 and 23. This exposure shows a vertical contact between the sandstone and the surrounding horizontal bedrock.

How can this be? How can sandstone be deposited in a vertical, nearly tabular form? There are innumerable possible explanations. The undisturbed nature of the surrounding bedrock in the Carrot Bluff exposure rules out some of them. One of the explanations that fits the evidence the best proposes that this part of the world was once a relatively flat, uplifted area where cracks in the water-soluble bedrock had been widened and deepened by rainwater to create what may have

been a pretty awe-inspiring landscape. (If there had been anyone around to see it.) Across this landscape flowed a few streams that moved gravel and sand into the area. Devoid of vegetation (geologists speculate that there were no land plants at this time), the land was susceptible to wind erosion. Wind carried the fine sand away from the stream edges, possibly in large enough volumes to create dunes that moved across the landscape, filling the solution-enlarged cracks in the bedrock.

Examples of this type of environment can be found today in the American southwest and in Australia. It is possible that these unusual sandstone masses were formed in this manner. We may never know, and a detailed academic study of the sandstones, not a geologic mapping project, would be necessary to provide any answers with certainty.

No matter what their origin, these

sandstones are interesting to visit and ponder. Two of the larger examples are found within Lake of the Ozarks State Park. One is located on the north side of the road to Camp Hawthorn, just west of the turn-off to Camp Rising Sun. There is a small parking lot adjacent to it. The other is more out-of-the-way in a tributary valley to Cloakley Hollow, downstream from Ozark Caverns. Another magnificent sandstone outcrop in the park is "The Lookout" along Four Winds Trail, however, the characteristics of this sandstone are quite different from the "mystery" sandstones, and it is thought to have a different origin than that described above.

The geology of an area is an integral part of its natural history, and familiarity with the geology of any place enhances the outdoor experience. Geologic maps for much of the lake area will be available later this summer.--Edith Starbuck

JAMES DAVID VAUGHN RETIRES

While the last issue of this newsletter was being printed, staff of the Geological Survey and Resource Assessment Division (GSRAD) were bidding farewell to James David Vaughn at a luncheon in his honor here in Rolla, Missouri. Vaughn, retiring after 25 years with the Department of Natural Resources, will start his own environmental company in the Bootheel where he was raised and both his mother and mother-in-law still reside.

During his tenure with the state,

Vaughn worked as a soil scientist and a geologist. His regular duties included geologic and hydrologic investigations of waste-water disposal sites, but his heart was into prehistoric earthquake

studies. For three years, Vaughn served as principle investigator of a USGS-funded study of prehistoric earthquake effects in the Bootheel's western lowlands. For another three-year span he was involved in studies of recent faulting in southeast Missouri.

Vaughn expressed his appreciation of working for the Geological Survey and the valuable experience he got working statewide. By traveling around the state doing waste-water investigations he was able to make "millions of observations of the soils, geology, and topography of the state. As a result, he has identified several additional features likely related to prehistoric geologic activity.

Before he started working for the state, Vaughn received his Bachelor of Science from Southeast Missouri University (SEMO) and credits SEMO and the University of Missouri – Columbia for the graduate courses he has accumulated. After graduation from SEMO he went to work as an excavating superintendent for a gravel



GSRAD's deputy director Bill Duley presents James David Vaughn a plaque commemorating his 25 years of service with the Department of Natural Resources.



company and then as a soil scientist for Stoddard County.

Other benefits of his retirement include earth science research and national/international travel for business and pleasure. The research of small soil mounds ("temple" or "mima" mounds) will continue in Missouri as well as in other states. He connects to past strong earthquakes.

We wish James David Vaughn the best in his research and consulting, and we expect to see him around the Survey doing occasional research. Old geologists never die, they just eventually petrify.--Susan Dunn

GEOLOGICAL SURVEY ACCEPTS ARROWHEAD COLLECTION

The Missouri Department of Natural Resources' Geological Survey and Resource Assessment Division at Rolla proudly announces receipt of an impressive collection of Native American stone artifacts donated by Estel Darwin Halmich of Bourbon, Missouri. The 200+-piece collection includes spear, dart and arrow points, knives, scrapers, drills, and adzes.

According to Pat Mulvany, a division geologist and resident Indian artifact expert, the artifacts in Halmich's collection range in age from the Paleo-Indian Period (10,000 BC) to the Mississippian Period (AD 1400). Projectile point styles, from oldest to youngest, include Clovis, Dalton, Graham Cave, Osceola, Etley, Langtry, Snyders, Scallorn, Sequoia, Reed and Cahokia. Most of the points are composed of various Missouri cherts, but a few are composed of Missouri rhyolite. The adzes are composed of diabase, an igneous rock.

The division intends to display the artifacts in an archeological manner that chronicles man's dependence on industrial minerals. Industrial minerals are the nonmetallic, mined commodities that promote development and sustenance of civilization. Limestone is an example of an extremely important modern industrial mineral. It is used to manufacture lime, Portland cement, and aggregate. Without limestone, we would not have buildings, roads, and bridges, as we know them today. Halmich's artifacts demonstrate that ancient man also depended heavily on a different industrial mineral, one that is not used much anymore. That mineral is chert, which breaks with a sharp edge. Ancient craftsmen shaped chert into a variety of specialized tools for cutting, piercing, drilling, and scraping. Their livelihood depended in large part on the mining and processing of chert.

Halmich began collecting artifacts in east-central Missouri in 1929 when he

was just a boy. The collection represents his lifelong passion for hunting artifacts in the hills and valleys of the Ozarks. He donated his collection to the division because he wants it to stay intact, and he wants it displayed in a place where school children can view it and be inspired by it.

"Each year, hundreds of school children and adults tour the instructive exhibits of minerals, rocks, fossils, and maps that are housed in the division's Rolla building," said Mimi Garstang, director of the division and State Geologist. "In the near future, visitors will also be able to view Halmich's equally instructive collection of artifacts while they are touring our facilities on Fairgrounds Road."

Mimi Garstang, Geological Survey and Resource Assessment Division Director and State Geologist for the Department of Natural Resources, accepts the stone artifact collection from Estel Darwin Halmich to be displayed at the Survey offices in Rolla.



NEW 2002 MISSOURI DROUGHT PLAN RELEASED

A 2002 drought plan for the State of Missouri has been released by the Missouri Department of Natural Resources. It replaces the 1995 Missouri Drought Response Plan and represents the work of the Missouri Drought Assessment Committee. The committee consists of representatives of the following state and federal agencies: the Missouri departments of Natural Resources, Agriculture, Public Safety, Health and Senior Services, Conservation, Economic Development, Social Services and the University of Missouri and the U.S. departments of Commerce, Agriculture, Army, Interior, Environmental Protection and Emergency Management.

The 2002 Missouri Drought Plan provides coordinated guidance for state and federal agencies during drought conditions. It also provides guidance for preparing for times of drought and is part of the integrated State Emergency Operations Plan of the State Emergency Management Agency.

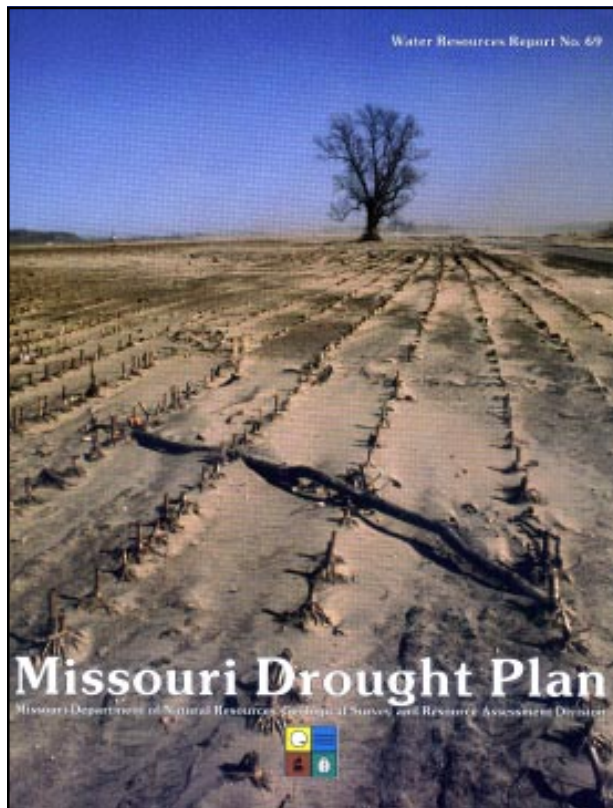
Missouri's susceptibility to drought is described in the plan, and the various local, state and federal agencies that are able to help in planning, evaluating and responding to drought conditions are listed, along with additional agency information.

The 2002 Missouri Drought Plan, which is in a book format, provides many helpful pointers that will be beneficial to local water suppliers and other parties.

The new report was prepared as part of the state water planning process. Other State Water Plan volumes discuss various uses of water, rather than a lack of water.

The 2002 Missouri Drought Plan is available from the department's Geological Survey and Resource Assessment Division at Rolla — call (573) 368-2125 or access the department's web site at www.dnr.state.mo.us for the electronic version.

For news releases on the Web, visit www.dnr.state.mo.us/newsrel.



ARDEL RUEFF RETIRES WITH RESPECT AND ADMIRATION FROM GSRAD STAFF

Once again a member of the Department of Natural Resources' Geological Survey and Resource Assessment Division staff got away before an extensive interview. The anxious retiree did not even want a good-bye ceremony, luncheon or dinner from the division staff. Was it because he was shy, emotional or afraid? We may never know 'cause he's just quiet like that.

Ardel Rueff, a highly-respected geologist for the division for almost 35 years, started out in the Economic Geology section under Jim Martin (division geologist, now retired). He finished his tenure as head of the now named Geologic Data and Acquisition Management (GDAM) section. "Heyward Wharton and I were glad to get another good Navy man on board," Martin said. "Believe it or not, Ardel (Art) came to us from the

State Park Board." (Note: the State Park Board became the Division of State Parks, which is also part of the Department of Natural Resources.) The Economic Geology section put Art to work with non-metallic minerals, where he showed the greatest interest. He specialized in dimension stone, crushed stone, sand, gravel, clay and shale.



Ardel Rueff, geologist, was surprised by Mimi Garstang, GSRAD Director and State Geologist, and her staff on July 18 at a reception in his honor at the division's warehouse on Gale Drive. Here, Mimi presents Art with a plaque commemorating his many years of service to the Department of Natural Resources.

DEPARTMENT PUBLISHES CENTRAL MISSOURI WATER PLAN REPORT

Rapid population growth in rural areas, especially in the vicinity of the Lake of the Ozarks, and widespread erosion and sedimentation are among significant water-use problems cited in "Topics in Water Use: Central Missouri," a State Water Plan regional report just released by the Missouri Department of Natural Resources.

This report is the second in a series of six regional reports being prepared by the department to identify water-use problems and opportunities throughout Missouri. The first report in the series was for northeastern Missouri.

The Central Missouri report covers a 21-county region that includes the middle reach of the Missouri River from Sedalia to Hermann and from Benton County and the Lake of the Ozarks across to Crawford County, including Fort Leonard Wood and Rolla.

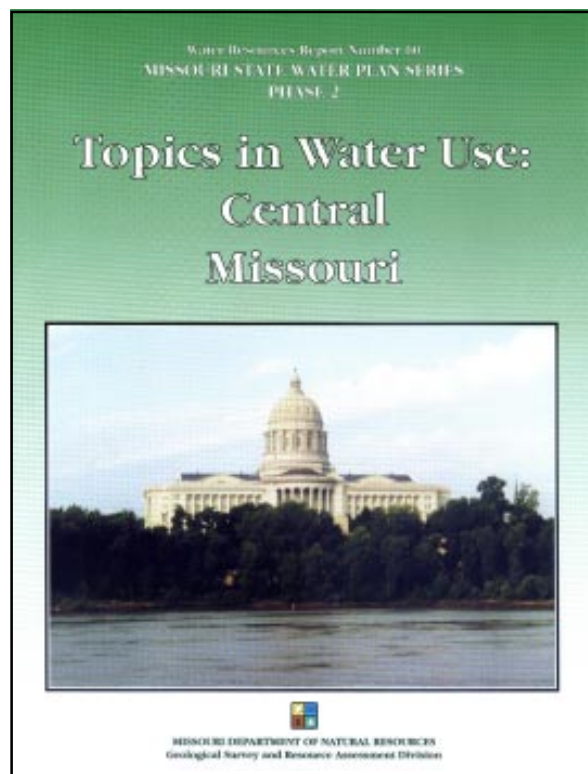
A later phase of the State Water Plan process will develop alternative solutions to the problems and get citizen input to determine which problems are most important and how best to address them.

An Inter-Agency Task Force, composed of several state agencies, has reviewed and commented on the report. A number of revisions in the report were made addressing their comments. The member agencies of the task force include the departments of Health and Senior Services, Conservation, Agriculture, Public Safety (State Water Patrol), the University of Missouri College of Agriculture, Economic Development and Transportation.

The third report in the series will focus on the western and northwestern counties of Missouri. A copy of the draft report is currently being reviewed by the department's Kansas City Regional Office. Work has already begun on the fourth report, which will cover the southwestern Missouri region.

Copies of the State Water Plan report are available from the Publications Desk of the department's Geological Survey and Resource Assessment Division, Rolla or by calling (573) 368-2125, fax (573) 368-2481, by mail or visiting at Missouri Department of Natural Resources, P.O. Box 250 (111 Fairgrounds Road), Rolla, MO 65402-0250.

For news releases on the Web, visit www.dnr.state.mo.us/newsrel.



Art Rueff continued from previous page...



What little background we could scrape together about Art has him attending the University of Missouri in Columbia and majoring in geology; attending high school in Hermann, Missouri; and growing up on a farm in Warren County on the Missouri River. He has a wife and two grown children. And, now he has retirement.

Rueff was involved in many books and projects. In 1968, he started working on Special Publication No. 1,

Missouri Minerals – Resources, Production, and Forecasts. His other books include *Ceramic Properties of Shales* and *Limestones of Northwest Missouri*. In his last six years with the division he became chief of the GDAM section and he and his staff have been mapping the bedrock and surficial materials of the state, topo by topo.

Ardel will be greatly missed by everyone at the Survey, but even more so by his immediate staff. He was recently awarded the division's Employee of the Month Award for his work organizing the 38th Forum on the Geology of Industrial Minerals conference in St. Louis in May, and for his "true concern about the personal welfare of his employees." He was nominated by all 14 of his section's co-workers.

In the future Art plans to return to his roots. He has two farms he needs to work on and he likes the idea of getting back into "Ag." Well, this is Missouri and we grow rocks here, so agriculture and geology just aren't that far apart. Good luck, Art. –Susan Dunn



Bill Duley, Deputy Director for GSRAD, and Jim Vandike, geologist, wrote and performed a song about Art's life working for the Department.

UPCOMING MEETINGS

American Institute of Professional Geologists-Association of Engineering Geologists (AIPG-AEG) Annual Meeting, September 24-25, 2002, Reno, Nevada. For more information contact Jon Price at (775) 784-6691.

Association of Missouri Geologists (AMG) Annual Meeting and Field Trip, September 27-28, 2002, Kansas City, Missouri. For more information contact George Kastler at (573) 751-5384 or leave your name and address at Email nrkastg@mail.dnr.state.mo.us.

Missouri River Basin Association (MRBA) Meeting, October 15-17, 2002, Nebraska City, Nebraska. For more information contact Richard Oppert at (406) 538-4469.

Geological Society of America (GSA) Annual Meeting, October 27-

30, 2002, Denver, Colorado. For more information call (800) 472-1988.

Arkansas-White-Red Basins Inter-agency Committee (AWRBIC) Meeting, October 29-30, 2002, Joplin, Missouri. For more information call Mary Woodland at (573) 751-2867.

National Waterways Conference, November 4-6, 2002, New Orleans, Louisiana. For more information call (202) 296-4415.

Missouri Society of Professional Surveyors (MSPS) Board of Directors Meeting and Fall Workshop, November 1-2, 2002, Lake Ozark, Missouri. For more information contact Sandra Boeckman at (573) 635-9446.

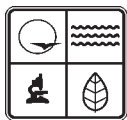
Association of State Boards of Geology Meeting, November 6-9,

2002, Biloxi, Mississippi. For more information contact Sam Swinehart at (803) 799-1047.

Association of American State Geologists (AASG) Cluster Meeting, November 13-16, 2002, Austin, Texas. For more information contact Scot Tinker at (512) 471-1534.

Upper Mississippi River Basin Association (UMRBC) Meeting, November 19-21, 2002, Minneapolis, Minnesota. For more information contact Holly Stoerker at (651) 224-2880.

Department of Natural Resources' Wellhead Protection Section's Well and Pump Installation Testing Schedule: October 9, November 13, December 11, 2002 and January 8, 2003. For more information contact Sheri Fry at (573) 368-2115.



MISSOURI DEPARTMENT OF NATURAL RESOURCES

Geological Survey and Resource Assessment Division
P.O. Box 250, Rolla, MO 65402-0250
(573) 368-2100

Please Circulate!

PRSRT. STD.
U.S. Postage
PAID
Permit #215
Rolla, MO

Integrity and excellence in all we do

Outlook is published quarterly by the
Missouri Department of Natural Resources' Geological Survey and Resource Assessment Division

Steve Mahfood
Department of Natural Resources Director

Mimi R. Garstang
Geological Survey and Resource Assessment Division Director and State Geologist

Susan C. Dunn
Managing Editor
H. Dwight Weaver
Editor

Outlook is available free of charge. Names are placed on our mailing list upon request.

